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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
NOGUEROLA, ALEXANDER STEPHAN	
ART UNIT	PAPER NUMBER
1743	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/733,857	MILES ET AL.	
	Examiner	Art Unit	
	ALEX NOGUEROLA	1743	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 December 2000* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 December 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Claim Objections

1. Claims 1, 3, 5, and 8 are objected to because of the following informalities:

a) Claim 1, line 2: "electrokenlic" should be -- electrokinetic --;

b) Claim 3, line 2: -- an – should be inserted between "channel," and -- improvement --;

c) Claim 5, line 2: "comprising" should be -- comprises --;

d) Claim 5, line 4: "electrode" should be -- electrodes --; and

d) Claim 8, line 2: "space" should be -- spaced --.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. Claims 1, 5, and 6-9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention:

a) Claim 1, line 4: -- each -- should be inserted between "of" and "said";

b) Claim 1, line 6: -- each -- should be inserted between "of" and "said";

c) Claim 5, line 4: the claim may be a little clearer if "parallel, with a" is changed to parallel to each other, and the --;

d) Claim 6: method steps should be in the active voice. So, the forming step should be replaced with two steps: a forming step and a sweeping step. For example,

-- forming at least one pair of interdigitated electrodes on a fluidic microchannel;

sweeping particles electrokinetically through the microchannel; --; and

e) Claim 7: is the electrokinetic flow field created by the electrodes in Claim 7 the same field that electrokinetically sweeps the particles in Claim 6?

3. Note that dependent claims will have the deficiencies of base and intervening claims.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

5. Claims 1, 3, and 5-7 are rejected under 35 U.S.C. 102(a) as being anticipated by Morishima et al. ("Novel Separation Method on a Chip Using Capillary Electrophoresis in Combination with Dielectrophoresis", Micro Total Analysis Systems 2000, 269-272, May 14-18, 2000).

Addressing Claim 1, Morishima et al. teach an apparatus for dielectrophoretic

concentration of particles under electrokinetic flow (the abstract), comprising

at least one microfluidic channel (Figures 1 and 2);

means for producing a DC voltage across ends of each said microfluidic channel (implied by Figure 1, which shows "DC voltage for CE");

at least one pair of interdigitated electrodes located on a surface of each said microfluidic channel (Figures 1 and 2); and

means for producing an AC voltage across the interdigitated electrodes (implied by Figure 1, which shows "High Frequency Electric Field for DEP [dielectrophoresis]").

Addressing Claim 3, the claim limitations may be found in the abstract and Figures 1 and 2. A means for applying an AC voltage as claimed is implied by the "High Frequency Electric Field for DEP" in Figure 1.

Addressing Claim 5, interdigitated electrodes as claimed may be seen in Figures 1 and 2.

Addressing Claim 6, Morishima et al. teach a method for concentrating particles under electrokinetic flow (the abstract), comprising

forming at least one pair of interdigitated electrodes on a fluidic microchannel through which particles are swept electrokinetically (Figures 1 and 2); and

applying an AC voltage across the interdigitated electrodes to establish a non-uniform electric field capable of trapping particles using the dielectrophoretic force (implied by the "High Frequency Electric Field for DEP" in Figure 1).

Addressing Claim 7, a DC voltage across the ends of the microchannel is implied by the "DC Voltage of CE" in Figure 1.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 1-7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over McBride et al. (US 6,296,752 B1) in view of Becker et al. (US 6,287,832 B1), Bakewell et al. ("Characterisation of the dielectrophoretic movement of DNA in micro-fabricated structures", Inst. Phys. Conf. Ser. No. 163, January, 1999, pp.73-76).

Addressing Claim 1, McBride et al. teach an apparatus for dielectrophoretic concentration of particles under electrokinetic flow (Figure 4; col. 3, ll. 47-55; and col. 5, ll. 45-52), comprising

at least one microfluidic channel (Figures 1 and 2);

means for producing a DC voltage across ends of each said microfluidic channel (electrodes 16A and 16B in Figure 4);

at least one series of electrodes located on a surface of each said microfluidic channel (electrodes 1 in Figure 4); and

means for producing an AC voltage across the series of electrodes (col. 1, ll. 41-54).

McBride et al. do not mention having the series of electrodes in the form of at least a pair of interdigitated electrodes. At the time of the invention several configurations for dielectrophoresis electrodes, including at least one pair of interdigitated electrodes, was known. See for example Figure 1B and col. 3, ln. 55 – col. 4, ln.16 in Becker et al. and the abstract and Figure 1 of Bakewell et al. Barring evidence to the contrary, such as unexpected results, the

choice of electrode configuration for the dielectrophoresis electrodes is just a matter of optimizing the apparatus for the intended analyte, which is implied and stated by Becker et al. in col. 5, ln. 52 – col. 6, ln. 4 and col. 14, ln. 50 – col. 15, ln. 10 (especially col. 14, ln. 67 – col. 15, ln. 2), where there is a discussion on how to optimize the structure, arrangement, and use of the electrodes. It would have been obvious to one with ordinary skill in the art at the time the invention was made provide a plurality of pairs of interdigitated electrodes in the microfluidic channel as taught by Bakewell et al. or Becker et al. in the invention of McBride et al. to, for example, optimize the apparatus for nucleic acid analysis (col. 14, ll. 40-49 in Becker et al. and the abstract in Bakewell et al.).

Addressing Claims 2 and 4, Bakewell et al. (Figure 1) and Becker et al. (col. 14, ll. 59-64) both teach providing a plurality of electrode sets. Again, this is just a matter of optimizing the apparatus. See in Becker et al. col. 14, ll. 59-64.

Addressing Claim 3, McBride et al. teach a microfluidic device using electrokinetic/electroosmotic flow to sweep particles down a microfluidic channel (the abstract and col. 3, ll. 47-55). McBride et al. also teach electrodes patterned on an inner surface of the microfluidic channel (Figures 1 and 4) and means for applying an AC voltage to these electrodes (col. 1, ll. 41-54). However, McBride et al. do not mention having the series of electrodes in the form of at least a pair of interdigitated electrodes.

At the time of the invention several configurations for dielectrophoresis electrodes, including at least one pair of interdigitated electrodes, was known. See for example Figure 1B

and col. 3, ln. 55 – col. 4, ln.16 in Becker et al. and the abstract and Figure 1 of Bakewell et al. Barring evidence to the contrary, such as unexpected results, the choice of electrode configuration for the dielectrophoresis electrodes is just a matter of optimizing the apparatus for the intended analyte, which is implied and stated by Becker et al. in col. 5, ln. 52 – col. 6, ln. 4 and col. 14, ln. 50 – col. 15, ln. 10 (especially col. 14, ln. 67 – col. 15, ln. 2), where there is a discussion on how to optimize the structure, arrangement, and use of the electrodes. It would have been obvious to one with ordinary skill in the art at the time the invention was made provide a plurality of pairs of interdigitated electrodes in the microfluidic channel as taught by Bakewell et al. or Becker et al. in the invention of McBride et al. to, for example, optimize the apparatus for nucleic acid analysis (col. 14, ll. 40-49 in Becker et al. and the abstract in Bakewell et al.).

Addressing Claim 5, interdigitated electrodes as claimed may be see in Figure 1 of Bakewell et al. and Figure 1B of Becker et al.

Addressing Claim 6, McBride et al. teach a method for concentrating particles under electrokinetic flow (the abstract, Figure 4, and col. 3, ll. 47-55), comprising

forming at least one series of electrodes on a fluidic microchannel through which particles are swept electrokinetically (Figures 1 and 4); and

applying an AC voltage across the series of electrodes to establish a non-uniform electric field capable of trapping particles using the dielectrophoretic force (col. 1, ll. 41-54). McBride et

al. do not mention having the series of electrodes in the form of at least a pair of interdigitated electrodes.

At the time of the invention several configurations for dielectrophoresis electrodes, including at least one pair of interdigitated electrodes, was known. See for example Figure 1B and col. 3, ln. 55 – col. 4, ln.16 in Becker et al. and the abstract and Figure 1 of Bakewell et al. Barring evidence to the contrary, such as unexpected results, the choice of electrode configuration for the dielectrophoresis electrodes is just a matter of optimizing the apparatus for the intended analyte, which is implied and stated by Becker et al. in col. 5, ln. 52 – col. 6, ln. 4 and col. 14, ln. 50 – col. 15, ln. 10 (especially col. 14, ln. 67 – col. 15, ln. 2), where there is a discussion on how to optimize the structure, arrangement, and use of the electrodes. It would have been obvious to one with ordinary skill in the art at the time the invention was made provide a plurality of pairs of interdigitated electrodes in the microfluidic channel as taught by Bakewell et al. or Becker et al. in the invention of McBride et al. to, for example, optimize the apparatus for nucleic acid analysis (col. 14, ll. 40-49 in Becker et al. and the abstract in Bakewell et al.).

Addressing Claim 7, for the DC voltage as claimed see in McBride et al. col. 3, ll. 47-55 and Figure 4.

Addressing Claim 9, controlling the voltage applied the interdigitated electrodes is taught in Figure 1 of Bakewell et al. This would optimize the separations.

10. Claims 2, 4, 8, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morishima et al. ("Novel Separation Method on a Chip Using Capillary Electrophoresis in Combination with Dielectrophoresis", Micro Total Analysis Systems 2000, 269-272, May 14-18, 2000) in view of Bakewell et al. ("Characterisation of the dielectrophoretic movement of DNA in micro-fabricated structures", Inst. Phys. Conf. Ser. No. 163, January, 1999, pp.73-76).

Addressing Claim 2, Morishima et al. teach an apparatus for dielectrophoretic concentration of particles under electrokinetic flow (the abstract), comprising

at least one microfluidic channel (Figures 1 and 2);

means for producing a DC voltage across ends of each said microfluidic channel (implied by Figure 1, which shows "DC voltage for CE");

at least one pair of interdigitated electrodes located on a surface of each said microfluidic channel (Figures 1 and 2); and

means for producing an AC voltage across the interdigitated electrodes (implied by Figure 1, which shows "High Frequency Electric Field for DEP [dielectrophoresis]").

Morishima et al. do not mention providing a plurality of pairs of interdigitated electrodes in the microfluidic channel. Bakewell et al. teach separating DNA in a microfluidic channel containing a plurality of pairs of interdigitated electrodes (in Baker et al. see the abstract and Figure 1). It would have been obvious to one with ordinary skill in the art at the time the invention was made provide a plurality of pairs of interdigitated electrodes in the microfluidic channel as taught by Bakewell et al. in the invention of Morishima et al. because this would optimize the apparatus for separating DNA.

Addressing Claim 4, Morishima et al. teach a microfluidic device using electrokinetic/electroosmotic flow to sweep particles down a microfluidic channel (the abstract and col. 3, ll. 47-55). Morishima et al. also teach interdigitated electrodes patterned on an inner surface of the microfluidic channel (Figures 1 and 4) and means for applying an AC voltage to these electrodes (col. 1, ll. 41-54). However, Morishima et al. do not mention having a plurality of pairs of interdigitated electrodes in the microchannel.

Morishima et al. do not mention providing a plurality of pairs of interdigitated electrodes in the microfluidic channel. Bakewell et al. teach separating DNA in a microfluidic channel containing a plurality of pairs of interdigitated electrodes (in Baker et al. see the abstract and Figure 1). It would have been obvious to one with ordinary skill in the art at the time the invention was made provide a plurality of pairs of interdigitated electrodes in the microfluidic channel as taught by Bakewell et al. in the invention of Morishima et al. because this would optimize the apparatus for separating DNA.

Addressing Claim 8, Morishima et al. teach a method for concentrating particles under electrokinetic flow (the abstract), comprising

forming at least one pair of interdigitated electrodes on a fluidic microchannel through which particles are swept electrokinetically (Figures 1 and 2); and

applying an AC voltage across the interdigitated electrodes to establish a non-uniform electric field capable of trapping particles using the dielectrophoretic force (implied by the "High Frequency Electric Field for DEP" in Figure 1).

Morishima et al. do not mention providing a plurality of pairs of interdigitated electrodes in the microfluidic channel. Bakewell et al. teach separating DNA in a microfluidic channel containing a plurality of pairs of interdigitated electrodes (in Baker et al. see the abstract and Figure 1). It would have been obvious to one with ordinary skill in the art at the time the invention was made provide a plurality of pairs of interdigitated electrodes in the microfluidic channel as taught by Bakewell et al. in the invention of Morishima et al. because this would optimize the apparatus for separating DNA.

Addressing Claim 9, controlling the voltage applied the interdigitated electrodes is taught in Figure 1 of Bakewell et al. This would optimize the separations.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEX NOGUEROLA whose telephone number is (703) 305-5686. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, JILL WARDEN can be reached on (703) 308-4037. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Alex Noguerola
December 2, 2002